ABSTRACT OF THE DISCLOSURE

[0033]   Apparatus and method operate to receive and reordering a multi-dimensional signal transmitted through a communication channel. The apparatus includes a slicer/encoder coupled to a pair-swap and symbol

5   alignment module that outputs to a decoder. The encoder operates with the slicer, and uses a coding method that reduces the number of bits associated with each symbol in the multidimensional signal as required to be passed through the pair-swap and symbol alignment module to the second decoder. The pair-swap and symbol alignment module detects and corrects pair-swap

10   and symbol misalignment in the multidimensional signal. The decoder includes a first part that operates to reverse the encoding done on the multidimensional signal by the encoder, and a second part that operates to correct errors that occurred in the multidimensional signal during its transmission in the communication channel. With the coding method, very

15   compact yet sufficient information is passed through the pair-swap and symbol alignment module to the second decoder. Thus, the number of flip-flops in the pair-swap and symbol alignment module can be significantly reduced because of the reduced number of bits for each symbol. Furthermore, the pair-swap and symbol alignment module performs symbol

20   alignment and pair-swap reordering in one pass, and uses very high degree

of serialization to further reduce the total number of flip-flops required.

Therefore, power consumption and size of circuitry are significantly

reduced.